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Education and Training: Playing a Bit Part in the Microcomputer Revolution?

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ABSTRACT

This research paper examines the extent of education and training on microcomputers in the military services and in industry. It focuses primarily on training within the Air Force, but also surveys the Army and civilian industry. The author weaves his own experiences with Inspector General and Air Force major command reports, to depict a need for increased training in that service. Similarly, he finds structured microcomputer training needed in the Army and in industry. He concludes with recommendations to achieve greater productivity from microcomputers; the chief recommendation is to fund and staff a cadre of computer experts on each installation to train, maintain, and manage computer users and assets.

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DISCLAIMER

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PART ONE

INTRODUCTION

INVASION

H.G. Wells could not have fashioned an alien invasion of earth that would have more comprehensively permeated the nature of society than the actual computer invasion of the last 20 years. Invasion seems the appropriate term--computers are in our watches, our toasters, our automobiles, our homes and offices, and in our hopes. They also play a big role in our expectations, and that is where this paper intersects with the invasion.

I contend major microcomputer users, such as the military services and industry, are not getting as much from their investment in small computers as they should--certainly, not as much as the purveyors of this invasion have promised. Further, I believe we are not reaping the potential benefits for at least two related reasons. First, the increases in office productivity promised by the small computer have not materialized. Small computer productivity seems rather a myth. In this century's first seven decades--decades without the small computer--American productivity rose at a rate of 2.3 per cent. However, since the dawning of the small computer revolution in the 1970s, our productivity growth has been stagnant at 1.2 per cent per year. (Krugman, 1990) The promise of high productivity and the reality of these statistics are at odds, and this paper attempts to find out why.

Second, I see a large gap in what office computers are capable of and what we actually do with them. My personal small computer experience as a user and a manager, paints a picture of underutilized machines with underskilled operators. This situation seems to be a

result of inadequate computer education and training, with emphasis on the latter. Computer education needs to be stressed for our managers and leaders; training needs to be stressed for the users and maintainers of microcomputer systems.

Certainly the small computer invasion has produced great benefits: electronic mail, picture-perfect correspondence, graphics capabilities to rival commercial artists, and data bases of information that can be searched in an instant. But why does productivity lag? My experience and research tell me that the answer is, in part, that the majority of users just don't have the requisite skill levels and computer understanding necessary to output at a more productive level. Why? Consider the following analogy.

The world traveler knows many architectural wonders: the Taj Mahal, the Eiffel Tower, Egyptian pyramids, and more. Each of these was created with hand tools, without the benefit of electricity or computers. Yet each is a work of art because of common threads: the master craftsmen that conceived and built them. These craftsmen were skilled in every aspect of their trade, particularly in the use of their specialized tools. Hammers, chisels, saws, and planes alone did not boost productivity and create these wonders; it took skilled people--people who worked years as apprentices to learn their trade from a skilled master. The PC is just such a specialized tool; yet today we seem to have forgotten the importance of the human element, for we pay little attention to training our small computer users and maintainers.

The extent to which we are faced with this situation and what we can do about it, form the basis of this paper.

PROBLEM STATEMENT

Are we investing enough in educating and training the people who use and maintain our PCs? Are our managers sufficiently knowledgeable to make sound computer-related decisions? Do we have adequate regulatory guidance to follow concerning small computer training? Do we have the skilled pool of experts necessary to effect a realistic small computer policy? In sum: Are we getting our money's worth with small computers?

This list of questions could be significantly expanded, but represents the direction and focus this study takes. To clarify our understanding, let's begin with a few definitions and an explanation of this paper's organization and structure.

DEFINITIONS

Hardware includes computers themselves and associated peripheral equipment such as printers, modems, facsimile machines, scanners, plotters, and cabling.

Information Manager is the Air Force name for an administrative specialist who works with microcomputers on a daily basis. However, this term is also used by the Air Force to refer to the one individual on a base that is responsible for all information managers at that installation; when used here in this context, you will find the term capitalized.

Small computer refers mainly to the personal office computer such as an IBM PC, Zenith 248, or Apple Macintosh. It can, however, mean something as large as an AT&T 3B2, a machine that is used primarily in local area networks and multi-user environments. Throughout this paper, the terms small computer, microcomputer, and PC are synonymous.

Software means purchased, off-the-shelf, commercially available packages unless otherwise specified.

System administrator refers an the individual responsible for local area network or multi-user system management.

User or operator will refer to the person who has a PC either on his/her desk or available for use--usually someone who does word processing, spreadsheet work, graphics, or data base creation and maintenance.

FRAMEWORK

Given the PC invasion, and our concern with a worthwhile return on our investment, this paper continues with an assessment of the current small computer environment as it relates to training and productivity. Due to the author's Air Force background, it focuses primarily on

the microcomputer situation in that service. However, it also discusses similar forces at play both in the Army and in civilian industry. It then engages in a brief discussion of related factors (i.e. magnitude of the problem, education versus training, etc.) applicable to the situation across all the services and much of industry, after which the section closes with a summary of findings resulting from this research.

Part III will explore future needs vis-a-vis the small computer and conclude with a set of recommendations to follow as we move toward the 21st century.

PART TWO
SITUATION ASSESSMENT

AIR FORCE

Ellsworth AFB. My last duty assignment was as the commander of the 2148th Communications Group at Ellsworth AFB, South Dakota--a situation that can serve as a typical example of the base-level small computer environment in the Air Force.

The Communications Group was responsible, by regulation, for all base training on small computers, including operating system knowledge and software use. Additionally, the group also facilitated PC maintenance and repair. Consequently, offices on base that experienced problems with microcomputers turned to us for training assistance and to arrange warranty service or contract maintenance. In some instances, we could help them solve their problem over the phone or via a short visit to check system setup. Other cases required a civilian technical representative's expertise.

Although we had two to three knowledgeable individuals to do these tasks, they were usually in positions that were not funded (i.e. taken "out-of-hide") and they were not specifically trained to do these tasks. We, thus, found ourselves in the same position as most other base-level communications units: hoping that the assignment "pipeline" would send us an individual who was a "hacker"--a computer enthusiast whose personal interest and drive would fill the void. Fortunately, we usually did find such individuals and were able to provide a modicum of service to the base.

We did not, however, have sufficient experienced manpower to train the base populace in small computer hardware and software use. Consequently, we scoured the installation for individuals who were talented enough to act as instructors on a voluntary, as-their-schedule-

permitted-basis, to train other users. When I arrived at Ellsworth, the base had 600 people signed up for this training, but we could not deliver due to a lack of instructors and equipment!

Funding was also a problem--our budget contained no money for hardware, software, or contract training. Nonetheless, our resourceful small computer management office (called an equipment control office in Air Force terminology) obtained 12 local Bombardment Wing computers for use on a temporary basis. These machines were, however, subject to the needs of the Bombardment Wing and could be (and were) recalled for use by other offices on base.

The situation grew worse--fewer funds, less equipment, and a shrinking pool of volunteer instructors. Matching student and instructor schedules was tough. We turned to the local Field Training Detachment (an Air Training Command unit) for help. The local commander, aggressive and visionary, secured a promise of training from his parent organization, Air Training Command. In fact, due in part to his lobbying efforts and higher headquarters' acknowledgement of the problem, his unit became an Air Force prototype for supplying such training. (Air Training Command normally provides initial career field-specific training only--hence, recurring, system-specific, training requirement at the base-level is not necessarily within the letter of their mission). Although back-logged, training progressed and we thought we were on the right track. Unfortunately, the program fell prey to declining budgets and manpower less than a year after its inception (Major A. Diaz, personal communication, September 17, 1991)

Another source of frustration was the contract maintenance money we spent for "broken" computers. Some indeed required extensive repair; yet many required as little as flipping a

switch or "re-seating" a circuit board inside the PC. If we had had knowledgeable individuals trained in minor maintenance and computer setup, many of those costs could have been avoided. The root of the maintenance problem seemed identical to the training difficulties I mentioned earlier--if we funded, staffed, and trained the right people to serve the need, we could not only save money, but glean a greater productivity from our PCs. Given this description of one setting within the Air Force, I had to wonder how wide-spread these problems were...and what was their impact?

Was the Ellsworth experience unique? Not according to my research with fellow communications unit commanders...and, not according to a very revealing Air Force Inspector General (IG) study of the information management career field. (AFIG, 1991) Let's examine this important study in detail, for it seems to summarize the problems we have with small computer training in the military services today.

Information Management Functional Inspection. The study cut across seven major commands and 14 bases from both active and reserve components. Here are the major conclusions:

(1) **Inadequate Regulatory Guidance.** Although two regulations--AFR 4-1 and AFR 700-26--charged the base Information Manager (IM) and the Base Communications Computer Officer (the Communications unit commander) with training responsibilities, neither did it definitively. (Air Force Inspector General [AFIG], 1991) AFR 4-1 states that the base IM will work with the communications unit to provide necessary training. As we've already seen from personal experience, communications units have been ill-prepared to perform this service. In fact, many communications squadrons have interpreted the guidance in AFR 700-26 (a loosely-worded tome) to mean that they would facilitate the process of finding rather

than providing adequate training for the rest of the base, via local contractors. Inevitably, many organizations have resorted to setting up internal training programs of their own. (AFIG, 1991)

This situation was not due to a lack of regulatory knowledge. All the Information Managers surveyed were aware of their training responsibilities, yet only one of the 14 provided any training to base users!

The communications unit performed most of the training that did occur; however, the quality varied significantly and the extent of training seemed dependent on whether the commander was both computer literate and took and interest in the problem. (AFIG, 1991)

(2) **Inconsistent Training.** Whenever training did occur, the level of instruction varied greatly, with duration being as little as 4 hours, and as much as 5 days. Standardization was also a concern. Each base that did have some type of training program had a different set of course materials; little evidence of inter-base cooperation existed, needlessly duplicating time and effort invested in course preparation. The IG found most of the training was conducted by commercial vendors who charged between $35 and $130 per student per day. (AFIG, 1991)

(3) **Lack of Computer Literacy.** The report found that a significant number within the base information management community didn't have a "sufficient level of computer knowledge to fully capitalize on office automation potential." (AFIG, 1991) Of 300 base administrative clerks surveyed, only 30 per cent had received any structured training. The following report excerpt highlights the results of this training deficiency:

> Underutilization of existing systems and software was evident. There were instances where software remained unopened and on the shelf, while individuals continued to use manual, time-consuming methods of processing

> documents. The team noted a prevalent lack of in-depth knowledge among information managers. Many had barely enough knowledge of the system and software to produce a final document. With the benefits of automation not fully exploited, many information managers were unaware of software features and reverted back to typewriters. In one case an individual composed an award citation and printed it on a laser printer in portrait format. The citation was then given to the secretary for retyping in landscape format. This process took over an hour when a simple print command during the initial composition would have produced the final product in a few seconds. More common were instances where documents were reaccomplished because the editing office did not have the same word processing software as the originating office. (AFIG, 1991)

(4) **No software standardization.** Although the report doesn't directly allude to a need for software standardization, the underlying message is clear: We need to curb the proliferation of different, yet functionally similar software packages. We expect to see different packages from base to base, yet even within one installation there is tremendous variance. The IG study found one base to have nearly 70 different packages! (AFIG, 1991) This proliferation compounds not only the training problem, but carries a large and unnecessary price tag as well. Further, it leads directly to reduced proficiency because base office personnel often move from one unit to another as manpower needs fluctuate. Ultimately, we lose in terms of our real goal...productivity.

The IG report is illustrative of the PC utilization problem across the Air Force, and is further substantiated by the stated needs of the major commands (MAJCOMs) themselves.

Major Commands. In February, 1991, prior to the IG study, the Headquarters Air Force organization responsible for small computer initiatives (HQ USAF/SCP) asked each Air Force major command to survey its units and determine training needs. HQ USAF/SCP also solicited comments on the effectiveness of using a regionalized version of Air Training Command's Field Training Detachments to alleviate the training problem. With small

exception, the findings were consistent across the MAJCOMs. These comments are representative:

> We have...identified a training requirement for hardware and software troubleshooting of standard computers, local area network administration, and security training. The base users require training on MS-DOS, word processing programs, database management, graphics, spreadsheets, local area network administration, as well as security. We support ATC [Air Training Command] initiatives [for training] however, we do not have manpower to give up for support. (HQ TAC/SCM, 1991)

> Our initial assessment...pointed to a large deficiency in the use of microcomputer applications...the more pressing need seems to be improving the understanding and sharpening the knowledge of base customers in the use of computer utilities and applications...In these times of scarce resources, a regional FTD probably would not work for word-processor type, DOS utility training. A regional facility could serve the needs of "Communicators," for more advanced applications of systems management, networking, topology and software troubleshooting. However, it would not fulfill the need of the larger pool of base customers who simply require confidence training on their day to day applications...We must also find a means of training our so-called professionals (49XXX) who are charged with serving base customers. (HQ SAC/SCP, 1991)

> It would be most helpful if tech schools would include training on small computers and data communications. Right now we get people with little or no understanding of them. (HQ USAF ACADEMY/SCO, 1991)

Tactical Air Command provided unsolicited comments regarding PC maintenance, that I believe focus on a large problem and a significant opportunity:

> Although hardware training was not mentioned, we know that this requirement is needed throughout the Air Force and can reduce contract expenditures. A good example of this is the 1912 CSGP's [Combat Support Group's] outstanding effort in training [local] maintenance technicians for TAC and others (i.e. ATC, SAC, NGB [National Guard Bureau], and Army). Within TAC, these technicians have proven that blue-suit [Air Force] first-look maintenance can reduce repair costs. In FY90, blue-suit technicians accounted for a cost avoidance in excess of $1 Million...Our technicians not only maintained the Tactical Air Force [TAF] wartime critical systems, but they also maintained Air Force standard computers for all TAF, SAC, and MAC units collocated with them in operation Desert Storm. This is why ATC's

> support to establish a hardware training course is vital to the Air Force mission. (HQ TAC/SCM, 1991)

This excerpt mirrors my experience at Ellsworth AFB and is an area that deserves serious attention. All the services have the opportunity here to decrease costs, increase customer satisfaction and increase productivity.

The MAJCOM responses also highlighted the need for trained people to act as system administrators for the many and varied networks that are proliferating throughout the Air Force. Presently, we don't have people specifically trained to do this job. If we don't step up to this challenge, I believe these networks won't provide us with the productivity benefits they promise either; in fact the result will more likely be increased user frustration and cynicism with the computer invasion.

There was, however, one MAJCOM that did not perceive a significant problem:

> The majority of small computer training at Wright Patterson AFB is provided by organic military and civilian instructors. Training at the Air Logistics Centers is handled by both contract and organic instructors. We also use interactive video disc, computer based instruction, and linear video in our self teach learning centers...Expansion of the ATC effort at Wright Patterson AFB is not required at this time. (HQ AFLC/DPUS, 1991)

This MAJCOM's experience may merit further investigation for applicability across the services. My initial reaction, however, is that AFLC may be blessed with a large, computer-literate population, and sufficient funds and equipment to handle an in-house training program of sizeable magnitude. Most other installations are not.

All this points to an inescapable conclusion: Training on small computers in the Air Force is insufficient compared to what managers and users feel is needed. My interviews with HQ USAF/SCX officials responsible for small computer training issues and computer

career field management in the Air Force confirm these needs and underscore the frustration felt at base level. (Maj S. Kuehl & Cmsgt L. Holifield, personal communication, October 8, 1991) Yet, dollar and manpower shortfalls combine to turn the problem into a genuine dilemma: Can we afford to train? Can we afford not to train? The initial answer appears to be "no" to both questions, but we'll explore some potential solutions to this paradox in the recommendation section of this report. But first, let's see how other agencies view the issue.

ARMY

Much like the survey of Air Force major commands, a recent Army conference entitled "Automation in the Schoolhouse" reflects some of the computer-related problems afflicting that service. Although geared to the school environment, I believe it tracks directly with the overall problem. Here are a few of the issues highlighted at the conference:

- INFORMATION MANAGEMENT

  - Information requirements are not being identified
  - Lack of knowledge of information management at all levels
  - [Training is] Not a priority and not a recognized need
  - No clear definition of Information Management Officer (IMO) duties
  - PCs have become a status symbol versus a tool

- Organization

  - ...Most schools have Information Management Officers, but they are not recognized or authorized. They are part-time for the most part and are taken out-of-hide.
  - Inability to plan, prioritize and integrate and maintain automated systems

These issues reflect the same kinds of concerns that keep turning up in my research on the problem of small computer training in the Air Force. Army officials at the Computer Science School at Fort Gordon, Georgia, see the problem in a similar light. They too sense the need for much more training at the user level.

A typical Army post has an Information Management Officer (IMO) who is in charge of small computers and user training. Much like their Air Force IM counterparts, Army IMOs have varying resources to accomplish their tasks. The resultant training can range from a well-organized, staffed and equipped center, to no training at all. Although regulations spell out a methodology for accomplishing training, the actual training that results is heavily dependent on installation commander perspectives and IMO personalities--a situation that mirrors that in the Air Force. And, according to the Army's Chief of the Computer Supported Learning Center at Fort Gordon, Ga, even though regulations prescribe the functions of the IMO, at some units there apparently are no manpower positions to support the IMO requirement! (Maj D. Carlsen, personal communication, October 14, 1991)

An official in charge of the Information Mission Area for Army civilian personnel explains that Army civilian computer professionals are educated primarily through another school, the Army Manageme Engineering College in Rock Island, Illinois. (N. Lewis, personal communication, November 4, 1991) I use the term "educated," because the school curriculum is geared to a higher-level and broader knowledge of computers than would normally be classified as training. Consequently, this school is used more as a vehicle to allow Army civilian specialists (GS-5 - GS15) in the Information Management Area to progress within their career field.

The civilian small computer users within the Army--like the Air Force information

managers must get their training via various, more unstructured methods. Nonetheless, there is a bona fide need for a definitized training methodology. The Chairman of the Information Science Department at the Rock Island-based College, agrees and cites a substantial need for increased PC training, tying it directly to automation productivity. (D. Watts, personal communication, November 20, 1991)

Army training, then, is accomplished much like it is in the Air Force: centralized and introductory--more often education vice training--and often not designed specifically for the people who use computers most.

Users end up getting their training either through personal perseverance or by hit-and-miss methods via co-worker, on-the-job efforts. The people responsible for post and base-wide training and computer expertise may or may not be assigned in sufficient numbers, and may or may not be trained and qualified to do their jobs. In the end, training is frequently inadequate and often personality, priority, and resource driven. We must now ask ourselves: if these are problems for the military's two largest services, are they problems for civilian industry as well? If so, how are they are dealt with?

INDUSTRY

Jim Hall-Sheehy, director of data processing education for American General Corporation, has done some interesting research concerning computer literacy in industry. His survey considered 21 Houston-area firms each with over 1000 employees and more than 25 personal computers. Here's what he found:

> Personal computer training is a woefully neglected field...Of the 21 companies, 10 offered nothing at all, 3 sent people out for training, 4 relied totally on software disk-tutorials and 4 offered some form of instructor-led

education. These statistics closely parallel a 1984 study conducted by International Data Corporation which found that 61 percent of medium-size U.S. companies offered no training for personal computers at any staff level.

His conclusions: "Education for personal computers is lagging far behind the arrival of the technology; and available training has a narrow scope." (J. Hall-Sheehy, 1991)

Another method of investigating what's going on in industry vis-a-vis employees' small computer skills is to look at the classified employment ads in a metropolitan newspaper. A quick look in such a newspaper's "Help Wanted" section reveals that almost all of the secretarial and administrative assistant positions require proficiency in word processing, spreadsheet and database software packages. (Washington Post, 1992) Where do people get these skills? How do companies meet the need? The answers to these questions are quite varied, but let's examine a few cases.

Some users who are computer literate have become so through the purchase of a home computer. Still others have made the transition from office typewriter to office PC. Some have had formal education either in secondary schools or college. In fact, California requires a fifth year of coursework in computer education before new teachers can be accredited in that state! (Bruder, 1988)

But it is unwise to believe that even "literates" feel adequately trained and skilled. Cheryl Currid in a revealing piece entitled "Computer literacy doesn't come with a college degree" points out that many college students still don't use a computer and many who do use one primarily for games and entertainment. (Currid, 1991) As a result, adequate on-the-job, training for the generation that has grown up with computers is not only a necessity, but also a persistent problem.

The manager of Dow Corning Inc.'s client computer support services, Carol Hartwig,

supports 3000 users in corporate headquarters. She found in many cases that training at Dow went "underground" in order to satisfy the need. She documented what she called "power users"--those especially proficient with computers--as playing a major role in making up for the shortfalls in training and expertise throughout the company. She conducted a survey in which she found that 65 percent of users had received one-on-one training from a co-worker. (Scheier, 1991) This highlights a significant need for training that is either not fully recognized or is ignored at the management level.

My personal experience with the prime defense contractor who built the Command Center for Strategic Air Command in Omaha, substantiates these findings. Many of this contractor's office workers were not familiar with the hardware or the software packages they had available. As a result, this company's own "power users" stepped in to train or perform computer set-up and troubleshooting services for their colleagues. The need was filled, but not through any structured company program.

One official at a major Washington D. C. area college (who requested anonymity) admitted to a department problem related to the lack of standardization we saw in the Air Force IG study. Here, training and proficiency difficulties were compounded by the lack of hardware and software standardization. Her problem, however, also brings to light a major misconception regarding the transference of computer skills. This particular individual was in charge of an office of seven computer professionals, one of whom had a computer science degree, another with a non-computer degree, and all with years of extensive experience on IBM-compatible microcomputers. However, when these people--unfamiliar with an Apple Macintosh system--were required to use the "Mac" without training, they came to her "tearing their hair out". They were simply unable to be productive on the system in spite of

being very computer literate.

A computer training professional for the University of California explains why:

> A funny thing often happens when a company buys Macintosh computers for the office. The equipment arrives, desks are cleared, plugs are plugged in, and befuddled employees sit staring at blank monitors...What's going on? Aren't Macs supposed to be self-explanatory? Simple to learn? Isn't it true that anyone can sit down and crank out professional-looking publications within minutes of unwrapping one of these things?
>
> No, they can't. But unfortunately this is the impression many office managers have of the Mac. Consequently they load up their offices with [computers and printers], and skimp on the one thing that would have made the machines truly useful: training.
>
> ...It all adds up to this: when training is set aside, so are the potential productivity gains of these wondrous new devices. Full productivity won't be achieved until you have an office full of 'power users.' (Cowlishaw, 1991)

Computer systems are complex...everything must be done perfectly in order for them to work as advertized. This requires extensive training and practice. Without it (supported by my own experience) hour upon hour can be wasted attempting to figure out the four or five keystrokes needed to accomplish a task.

As we can see, industry has the same kinds of training needs evident in the military services.

RELATED FACTORS

Although the discussion to this point gives the reader a reasonable feel for the need for more microcomputer training, there are a variety of additional relevant factors we must consider to put the problem in perspective. One of the first such factors should be an estimate of the size of the problem.

Magnitude. If we were talking a relatively small number of computers and users, perhaps the problem would not be worth worrying about. Yet, the data show otherwise. Lt

General Robert Ludwig, Air Force Deputy Chief of Staff for Command, Control, Communications and Computer Systems, recently indicated that "350,000 to 400,000 small computers are in the Air Force inventory, and the numbers are growing." (Ludwig, 1991) The Air Force IG report cited earlier stated that there were 204,000 small computers Air Force-wide at a value of over $445 Million. (AFIG, 1991) This 100,000 to 200,000 disparity in figures is striking. Does anyone really know how many computers we have? If we are to believe the general's figures, we will soon have more small computers in the Air Force inventory than people! Have we taken an approach to maximize hardware in the blind hope that productivity will follow?

An Air Force logistician that I spoke with believes that the numbers discrepancy may well be a result of counting, or not counting, all the small computers we have that are broken and awaiting either parts or maintenance. (Col D. Blazer, personal communication, Nov 25, 1991)

In any case, the hardware and software investment is significant: unfortunately our investment in training doesn't appear to have kept up. But by what measure do we compare these two categories of investment?

Investment. A logical question at this point is: "How do we determine what we should spend on training?" Robert Neilson of the Information Resources Management College in Washington D.C. offers some insight:

> Most of the microcomputer projects that have shown the greatest promise are those that have invested significant amounts of time and effort to train users in all facets of software application packages that run on them. Most successful projects have followed a pattern that is based on research conducted by the National Science Foundation: when automating, spend 10% of total cost on hardware; 40% of total cost on software; and 50% of total cost on training. (Neilson, 1985)

We can't directly construe the service and industry acquisition of small computers as microcomputer projects, but we can make a rough correlation. In the case of Air Force requirements contracts for PCs, no training has been purchased outright--only the option to buy training, and this decision is left up to the purchasers at the installation level. My experience, however, is that training is rarely purchased because of budgetary limitations. This practice is much like buying a new tank for the Army and not providing training for it. I'm sure some former tank drivers could figure much of it out, but you wouldn't get the most bang for the buck, and that is exactly what's happening with small computers.

The problem may well be one of uninformed management. Computers work. Our people can "use" them. But where's the productivity? It may be sitting in the training request folder at the bottom of management's in-basket!

Management. Managers often compound the problem because of a lack of real understanding about small computers. And, it starts at the top--Presidential spokesman Marlin Fitzwater, commenting on the President's new computer, didn't know what a 'mouse' was. (McCormack, 1991) The top executive at Ashton Tate, the company responsible for the highly successful database package, DBASE, didn't know how to use the program himself. (McCormack, 1990) Bank managers make decisions on the limitations of computers to aid their staffs when they've never used one; others deny modems for use by their employees because they don't comprehend the potential benefits. (McCormack, 1990) And, managers who don't understand that using the PC effectively requires a significant investment in training, don't budget for it.

Finally, there may be an organizational reason why senior military managers do not fully understand the problem or feel it is not of sufficient magnitude to take action. You will find

the largest and most knowledgeable groups of computer literate individuals at intermediate and higher headquarters levels. The forces behind centralization have ensured that each major command in the Air Force has a large contingent of these professionals to serve it. For example, Headquarters Air Force in the Pentagon, has the 7th Communications Group dedicated to its computer and communications support. These people provide the necessary expertise for training, system set-up, hardware and software troubleshooting, and maintenance support, that appears to be missing at lower echelons. Their presence does not completely eliminate the problems we have been discussing, partly because the number of individuals dedicated to these tasks are not large. But they do go a long way to diminish the negative impact on small computer users in these organizations.

Education versus Training. Another element that we must examine is one I've already hinted at--the difference between training and education. There is certainly a place for both, but our overriding need is quality training. Using the computer is a skill--just like the craftsmen who built the Eiffel tower. Don't use the skill for a while and you start to lose it; it's not like riding a bicycle--i.e. something you never forget. Education, on the other hand is more broad, all encompassing, and helps the user and the manager to pull different concepts together--to see how the machine might be used to improve productivity, whether it be individual or company productivity. This is not to say that education doesn't have its place. It does. In fact, the more successful users of computer systems believe their understanding of small computers and operating systems enhances their ability to use a variety of computer systems. (AFIG, 1991) What we begin to see is that training is perhaps the bridge between educational theory on the one hand, and productivity on the other.

FINDINGS SUMMARY

What can we glean from this assessment? We've seen a major change in our world--the small computer invasion and its extension into our homes, our offices and our expectations. The productivity data we have don't add up to match those expectations. "Why" seems to center on neglected investment in the people who operate and maintain small computers. We have vague regulations, managers who lack sufficient understanding, and users who don't have the requisite skills to achieve real productivity. We also lack a sound system of imparting computer skills to our people, and leave their education and training largely to chance. We misdirect funds on costly maintenance when a small investment in training technicians could pay big dividends. Increased productivity has been a myth because the computer's importance seems to have overshadowed the importance of the person who uses it. Computer professionals throughout the military and industry view the problem similarly. The situation is by no means bleak. If we recognize and begin addressing our training problems, we can realize our vision of increased productivity. The small computer is a marvelous tool in spite of our unmet expectations. To fashion more realistic expectations and build a roadmap to achieve them, let's look at some future trends and then discuss some recommended solutions to the problems I have described throughout this paper.

PART THREE
THE FUTURE:
A RECOMMENDED PATH

TRENDS

With declining budgets and manpower rolls, we must find ways to do more work with fewer resources. That means increased productivity. The goal is simple. The means are complex. As we are forced to devote more resources to the operations "front" and less to support the logistics tail, we have to find ways to be more productive. Small computers can certainly help, but only if we have skilled people to use and maintain them. In order to devise a methodology for achieving the goal, we have to look at what we think the future of automation will be for the services. Here are my thoughts regarding that vision.

Increased usage. The future will likely see the continued proliferation of the small office computer. That proliferation will continue in two forms: (1) the stand alone PC on which the user will perform graphics, word processing, spreadsheet and data base functions; and (2) the network, wherein individuals are linked via computer/communication systems.

If recent experience in Desert Storm is any indication, the small computer will be a major player in any future engagements. As already noted, Tactical Air Command technicians played a large role in maintaining small and mainframe computers in that campaign. We must ensure that we have a ready, trained group of experts to field for such future contingencies. The microcomputer's presence in the workplace is largely accepted and understood, but the network deserves special mention.

Networks. Networks will become much more prevalent and in some cases will supplant the need for stand-alone machines. Networks promise to be a long-range solution to the

automated productivity quest. This is because they facilitate the quick transportation of human ideas along with the data and information required to generate those ideas and to build on them. This process of concept generation and rapid data and information exchange equates to productivity and is part of a large governmental effort known as Corporate Information Management (CIM).

The advent and proliferation of networks, however, mandates a greater present emphasis on small computer training. Computer literacy is additive and one must build on basic concepts before moving to more complicated tasks. Networking will require a much more sophisticated user--with skills gleaned from quality training and experience. For example, Allied Corporation, a large manufacturing firm, understands this building block approach to computer literacy and has implemented a hierarchical curriculum to train its employees on networks. (McEwreath, 1984)

If this vision is to become reality we must determine what mix of people we need to operate in a more fully automated world. What kinds of skills will they need? How and where will they obtain these skills? And, how will we allocate our resources to ensure we get the maximum return on our investment? I am convinced of one thing--we have to put aside the notion that computers and networks will cut our costs while maintaining or boosting our productivity. People, not computers are the real productivity tools, and we must invest in them as we do hardware and software.

RECOMMENDATIONS

Professional Cadre. The Army and Air Force are on the right path with the concept of an office responsible for computer expertise at the installation level. However, they just

haven't gone far enough--concepts, regulations, and intentions all need to be backed by action. Each installation must have a core team--a cadre--of individuals that is able to perform: training, system set-up, user needs assessments, software and hardware troubleshooting, and maintenance. It is imperative that these cadres be excellently trained, sufficiently funded, and staffed to handle the installation's needs. The Air Force functional management inspection referenced in the early pages of this paper has a similar recommendation (i.e. establish a base focal point), but doesn't give details. (AFIG, 1991) Here are my details:

Training should include basic principles of computer operation (i.e. how to use the operating system) and software package instruction (for standardized word processing, data base, spreadsheet and graphics packages). Our operators must also know how to efficiently use electronic mail and bulletin board services. System set-up includes installation and check out of the computer, and file and menu construction to fit the user's needs. User needs assessments are crucial because so much unnecessary software and hardware is purchased without a real understanding of the capabilities needed or alternatives available. Software and hardware troubleshooting entails both telephone and office visits to determine if problems are due to malfunctioning hardware or software, or are the result of user error. Maintenance refers to the ability to troubleshoot and replace components down to the "board" level. The Headquarters Air Force Computer Personnel Functional Manager is already exploring the feasibility of this type of maintenance, based on a 20% savings realized by Tactical Air Command (Cmsgt L. Holifield, personal communication, October 8, 1991)

The present concept obviously lacks muscle since regulations requiring their presence haven't guaranteed their existence. Training for these cadres is the subject for my next

recommendation.

Consolidated Training. Each of the tasks outlined for the installation cadre apply to all services and industry. There will be differences in machines, software, and networks, but the fundamentals are the same. In this era where budgets are trimmed, forces are reduced, and "jointness" is stressed, consolidating the training of these cadres is logical. It is expensive and wasteful to duplicate entire schools and staffs across the services when regional, joint training facilities could supply a comprehensive and standardized curriculum. It is not this paper's place to detail such a project, and admittedly it would take significant organizational effort. The long-term rewards, however, could be felt in taxpayers' wallets and in the form of improved service at the unit level. One key to being able to do successful consolidated training, however, is achieving an appropriate level of standardization. The importance of a centrally managed effort toward this standardization end is fully recognized in the CIM effort, and cannot be overstated.

Standardization. The Air Force has gone a long way to mandate hardware standardization across the wide range of available small computer hardware. It has devised the "requirements" contract allowing buys of indefinite quantities of computers over the period of the contract. This, backed up with enforced regulatory restrictions, has given the Air Force a high degree of hardware standardization and very low PC prices. This practice needs to be extended completely across the Department of Defense; the results will be lower costs, and a better trained and more versatile work force. Further, if we fully consolidate the contracting effort among the services, additional cost benefits can be realized: quantity buys should reduce prices further, and having one responsible contracting agency instead of several will also reduce duplicative manpower efforts.

Software standardization is another area that holds great promise for cost reduction and diminished training problems. Today, there are virtually no commercial software purchase standards in the military. Often the choice for what software package an office uses is dictated by what the requestor is most familiar with, by what the rest of the organization uses, or often even by what the senior executive secretaries on the base or post use. While at Ellsworth AFB, I frequently received requests for software from a wing, group or squadron commander with the rationale that no other software would do what this package would. Almost always the real reason was that an individual who had used it before didn't want to use anything else. This is a wide-spread phenomenon. I have witnessed it at every base I've been assigned, and it persists today in my present assignment as a student at the Industrial College of the Armed Forces (ICAF).

For example, there is a very good commercially available software package known as "Enable O/A." It has the advantage of having three separate functions integrated into one product: word processing, spreadsheet, and data base. What it doesn't have are snob appeal, high name recognition (although it is used throughout the military), and high cost. In fact, it usually costs one third what similar software does packaged separately. I believe a primary factor in its non-acceptance on a wider scale is simply that it isn't what "industry" is using and, it's not what our users know. That's also the consensus of some computer professionals I've spoken with at ICAF.

I'm not advocating the use of Enable O/A here. What I am doing is pointing out that the services would accrue benefits by implementing software standards for small computers. One is obviously cost, resulting from centralized, quantity buying; another is savings in training costs and increases in user productivity. Such standards would allow military

members and government civilians to transfer from one job to the next and bring their proficiency with them.

Software standardization could be implemented either through a source selection process or through a survey of what is most commercially in demand. For example, a perusal of the Washington Post "Help Wanted" section finds that approximately 90% of the ads require proficiency in Word Perfect version 5.1; for those seeking spreadsheet experience, Lotus 123 tops the charts, and in database packages it's DBASE. (Washington Post, 1992) Regardless of how it's done, standardization of common office software holds much promise for the services and is long overdue.

Training Aids. Even with a training, assistance, and maintenance cadre at the installation level, workloads will be heavy. There are a variety of tools today that can be used to enhance training and alleviate the heavy demand. These include video instruction, and interactive computer-based tutorials. One school's approach to compensate for a small staff, is to bring users to a level of "self-sufficiency"--i.e. the ability to function at a computer terminal on a college-wide network--and then make these supplementary forms of training available. (Cmdr J. Heflin, personal communication, November 19, 1991)

This approach mirrors that being used effectively in industry today. As Northwest Airlines' employees have become computer literate, that company's focus has shifted to a system using video cassette recorders linked to the office PC screen for supplementary training. (Mayer, 1991) Writing for Data Training Magazine, John Mayer points out several advantages of the video method:

> First and foremost, it's extremely flexible. It can be used anytime and anywhere, and it's easy to use and immediate. Trainees don't have to wait around for an instructor and classroom to use a video. In addition, it's an

> excellent self-paced training tool. Finally, video is cost-effective. Training departments can use it over and over again without incurring additional costs. (Mayer, 1991)

Bill Slabey, Manager of PLATO (A computer-based software training program) Training and Education for Control Data Corporation lists ten advantages for computer-based instruction. They are: (1) Individualized instruction; (2) Self-paced curriculum; (3) Privacy--students aren't embarrassed to ask questions or make mistakes; (4) Immediate results; (5) Speed; (6) Accountability; (7) Consistency; (8) Up-to-date course materials; (9) Convenience, and; (10) Cost-effectiveness. (McEwreath, 1984)

The services can realize these same advantages if they apply these methods to their own training problems. Certainly there will be difficult choices in the coming years regarding funding and training vis-a-vis operational priorities; computer-based interactive tutorials and video instruction tools can go a long way to bridge the fiscal gap in the lean years ahead.

Start Now. "Kicking the can" further down the road will only exacerbate the problems and frustrations. Training is expensive and time consuming, yet it may be the best way to realize increased productivity. We must have a cadre of hardware and software experts on each installation that can provide the foundation for a realistic approach to our pervasive small computer needs. If we are to reap the promised rewards of networks and increased automation, we must have a rock-solid skill base on which to build.

CONCLUSION

The small computer has irreversibly invaded our world. We need to understand some basics about this technology. Foremost is that the computer is only a tool and not a cure for our productivity ills in and of itself.

As with most new technology, education and training have lagged implementation--they have played a "bit part". Recognition of the needs and action required to bridge the gap is in various stages throughout the military services and industry. Consequently, training for small computer users has been inadequate.

The problem manifests itself throughout our workforce, and--even though industry may take a more aggressive training stance than the services--it is clear that a good many PC users still lack the necessary skills to allow them to reach their productive potential. The result is our current productivity/expectation gap.

We have reviewed a variety of initiatives that can and should be examined to reduce costs and increase productivity, most important of which is to create, fund, and staff a core team of small computer experts within organizations. Next, greater standardization of both hardware and software among agencies, and especially the services, can only help to achieve greater efficiencies as we weather the recession and streamline our organizations to fit the global pattern of ever-increasing competition.

The greatest challenge may be overcoming management inertia. Just as Paul Krugman speaks of the U.S. economy in terms of "getting by" in his book The Age of Diminished Expectations, so too do managers allow themselves and their employees to muddle along with limited computer skills. It's time we became "all we can be" through a consolidated and concerted small computer education and training effort.

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